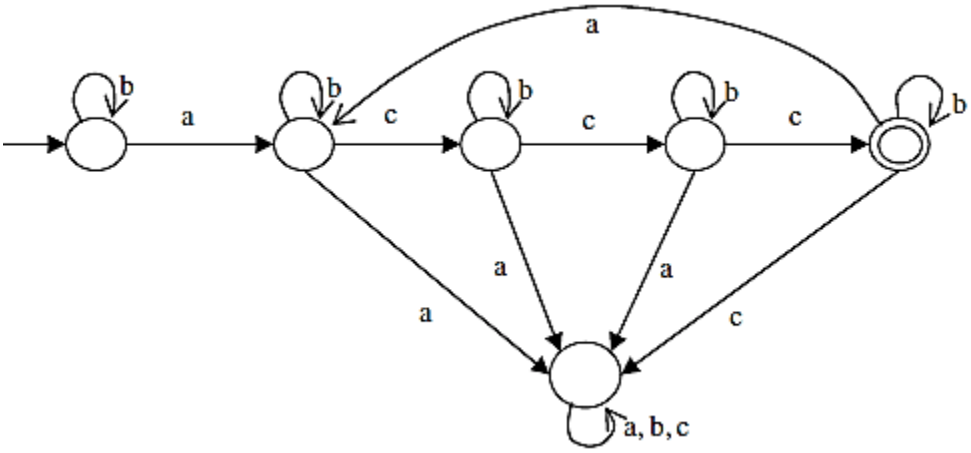
THEORY OF COMPUTATION

(Recursive Enumerable Sets, Turning Machines, Un-decidability)

1. Consider the machine m.



The language recognized by m is

(a) $\{w \in (a,b)^* \mid$ every a in w is followed by atleast 3 $c's\}$
(b) $\{w \in (a,b)^* \mid$ every a in w is followed by exactly 3 $c's\}$
(c) $\{w \in (a,b)^* \mid$ w contains $'accc'$ as a substring$\}$
(*d*) $\{w \in (a,b)^* \mid$ every a in w is followed by exactly 3 c's and any number of b's will appear in 'w' at anywhere$\}$

2. Consider the following grammar which of the following is/are ambiguous?

(i) S → y | Sxs
(ii) S → E | Exs and E → y
(iii) S → Sxy | y

(a) i only
(b) ii only
(c) iii only
(d) None of these

3. Consider the following CFG, find the number of productions in the minimized grammar after it was convert it into Greibach normal form.

S → AA| 0, A → SS | 1

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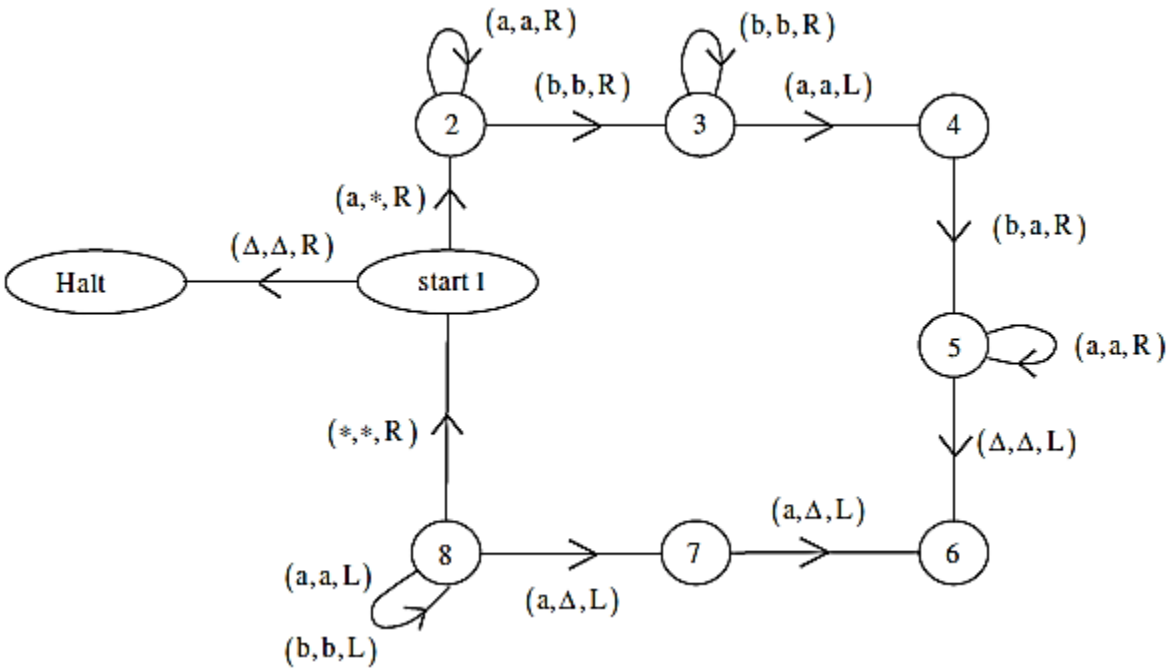
4. Which of the following is not decidable problem?

(a) A sting is generated by C.N.F or Not?
(b) A given non-terminal A in a given grammar CFG is ever used in the generation of word
(c) Given context-free Grammar generates an infinite language or a finite language
(d) None of the above

5. Consider the following T.M.

{Note Σ ={a,b}
⌈ = {*,a,b}
Δ = empty cells of Tape.



Which of the following string does not accepted by T.M. ?

(i) aabbaa
(ii) ∈
(iii) aabb

(a) i & ii
(b) ii, iii and iv
(c) iii and iv
(d) iv only

6. Consider the PDA M $= \{\{q_0, q_1\}, \{0,1\}\}, \{0,1, z_0\}, \{q_0, z_0, q_F\}$

$\delta = \{((q_0, 0, z_0), (q_0, 0z_0)), ((q_0, 0,0), (q_0, 00))\ ((q_0, 1,0), (q_0, 10))$
$((q_0, 1,1), (q_0, 11), (q_0, 0,1), (q_1, \in))$
$((q_1, 0,1), (q_1, t)), ((q_1, 0,0), (q_1, \in))$
$((q_1, \in, z_0), (q_F, \in))$

The language corresponding to above PDA is

(a) $L = \{0^n 1^n 0^n / n \geq 1\}$
(b) $L = \{0^n 1^n 0^{m+n} / n \geq 1\}$
(c) $L = \{0^n 1^{n+m} 0^m / m, n \geq 1\}$
(d) $L = \{0^n 1^n 0^m / m, n \geq 1\}$

7. Which of the following does not perform with the help of Turing Machine?

(i) Addition of two Numbers i.e., f(m,n) = m+n
(ii) Multiplication of two numbers i.e., f(m,n) = m+n
(iii) Acceptance of language $L = \{W / W \notin (a, b)^*\}$
(iv) Acceptance of language $L = \{a^n b^n c^n d^n e^n / n \geq 1\}$

(a) i and ii
(b) iii and iv
(c) iii only
(d) None of these

8. Which of the following is a context free language

(i) $L = \{a^m b^m c^k : n = m \text{ or } n \leq k\}$
(ii) $L = \{a^n b^n c^n \mid n \geq 0\}$
(iii) $L = \{a^n b^m c^k : n = m \text{ or } m \neq k\}$
(iv) $L = \{a^n b^m c^k \mid n, m, k \geq 0\}$

(a) iv only
(b) i, ii & iv only
(c) ii & iii only
(d) iv & iii only

9. Let $\Sigma = \{a, b\}$ and $L = \{a^n w a^n : n \geq 1, w \in \Sigma^*\}$ consider the following statement

(i) L has regular expression a * (a + b) * a *
(ii) L is Non-Regular language
(iii) L has CFG S→ aSa | aS | bS | aa where S is variable
(iv) L has CFG S → aSa | axa where S, X are variable
X → aX | bX | λ

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Which of the following is/are true?

(a) i only
(b) ii and iii only
(c) i and iv only
(d) iv only

10. Consider the following CFG, find the number of productions in the minimized grammar after it was converted into Chomsky normal form.

$$S \rightarrow s+a \mid s*s \mid a \mid b$$

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